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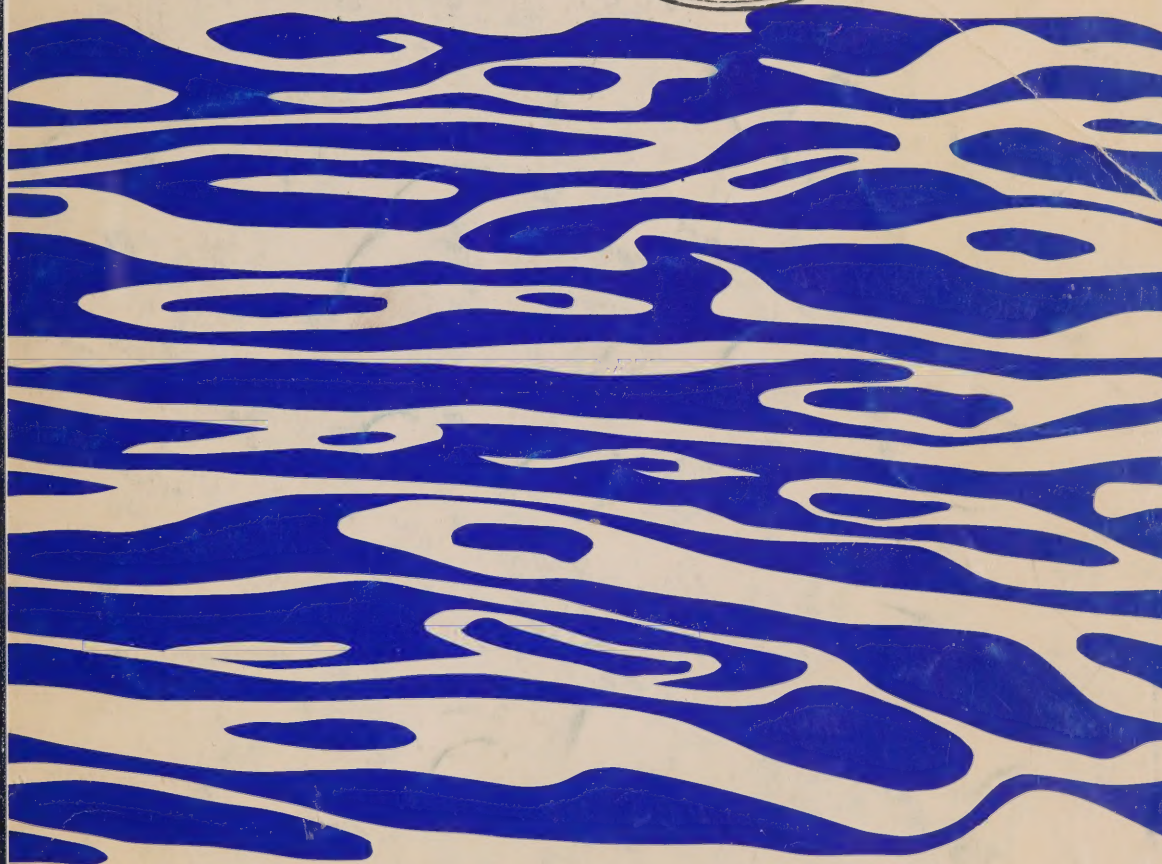
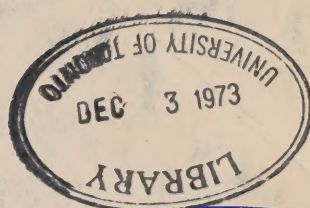
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Second Report on James Bay Environmental Studies Status of Projects as of December 1972

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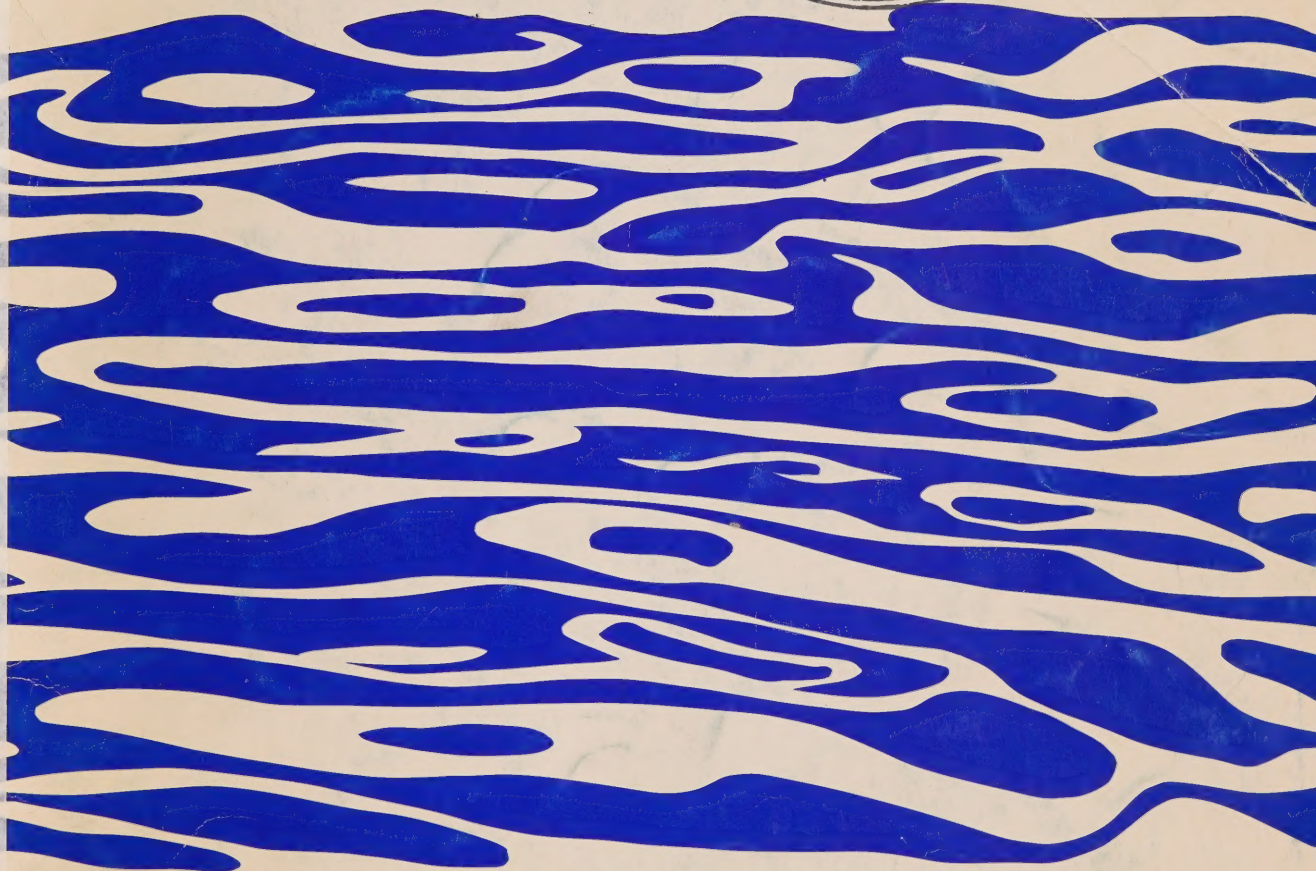
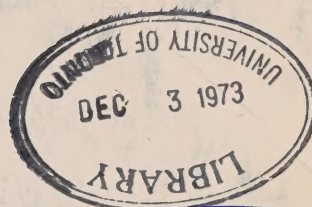
Second Report on James Bay Environmental Studies Status of Projects as of December 1972

Cross-mission Project
Group

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SECOND REPORT

ON

JAMES BAY ENVIRONMENTAL STUDIES

STATUS OF PROJECTS

AS OF DECEMBER 1972

Prepared by the Cross-Mission Project Group,
Environment Canada.

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INTRODUCTION

In April 1971, the Government of Quebec announced its intention to develop the hydro-electric potential of a number of Quebec rivers which flow into James Bay. In July 1971, the National Assembly of Quebec by Bill 50 established the James Bay Development Corporation to oversee and arrange the integrated development of the area, including hydro-electricity, recreation and tourism, forestry, mining, urbanization, communications, transportation, and all the other facets of northern development. The James Bay Energy Corporation, a subsidiary of the Development Corporation and Hydro Quebec, is specifically responsible for the hydro-electric project.

Because of its magnitude, this hydro-electric project has rather naturally drawn much public attention. Based on systematic development, the rivers of the Corporation's area offer an ultimate potential of more than 12,000 megawatts. Quebec installed its first 12,000 megawatts between the turn of the century and 1970; it now foresees the possibility of doubling this in a much shorter time. The northern complex, selected for first development, is centered on La Grande river, and reflects drainage basins totalling over 64,000 square miles made up of La Grande (37,800 square miles) plus parts of three other rivers: the Eastmain (by diversion of the Opinaca, a tributary), the Great Whale (flowing into southern Hudson Bay), and the Caniapiscau (flowing into Ungava Bay). The basic La Grande scheme will produce in excess of 8,000 megawatts and calls for an investment of about 6 billion dollars.

Governments today are aware that engineering projects of such magnitude, while offering benefits in line with their original purpose, will inevitably create environmental impacts on a comparable scale. Mindful of this, the Quebec Government and the Federal Department of the Environment undertook to identify the kinds of environmental problems which could be expected to arise from the development. Subsequently, resource studies have been undertaken to gain as much knowledge as possible about the interaction of forces in nature before major development begins;

in that way, it will be possible to continue monitoring these forces during developments, to identify environmental problems at a stage when they are still manageable, and to advise the project managers on environmental design.

In July 1971, the same month in which Bill 50 came into force, the provincial and federal governments set up a joint task force to make a preliminary evaluation of potential environmental impacts resulting from hydro-electric and other developments. Even at that time the Canadian Wildlife Service was taking its first steps towards specific field studies of goose habitat in the area. The task force produced a report, "Preliminary Study of the Environmental Impacts of the James Bay Development Project, Quebec", which provided a broad survey of possible and probable impact areas. That report was released early in February 1972.

At this stage, a Departmental Cross-Mission Project Group was set up to take the identification of environmental concerns a step further. This is described in the next Section.

Lands, Forests and Wildlife was appointed lead service for the purpose of a detailed agreement negotiation with James Bay Development Corporation. In late 1972, this federal-provincial agreement, providing for a 4-year biophysical inventory and environmental impact program in the James Bay area, was signed by the Honourable Jack Davis, Minister of the Department of the Environment (Canada) and Mr. Charles Boulva, President of the James Bay Development Corporation, to which Quebec had delegated the responsibility for the environment in the area. The agreement categorizes studies as (1) national, or studies of federal interest which are normally carried out by federal agencies, and (2) mutual, i.e., both federal and provincial agencies are concerned and are interested in the results. There may also of course be studies that are of concern primarily to the province and its agencies.

In the autumn of 1972, the Indian Association of Quebec and the Inuit Association sought an interlocutory injunction against the James Bay Development Corporation, calling for a complete cessation of exploration and development work until native rights are legally clarified and

until environmental impact studies demonstrate, to the satisfaction of the Indians and Eskimos, that no harm will be done to the natives' traditional way of life. At the time of writing, this litigation is still before the courts.

The purpose of this report is to give an overview of the various scientific investigations, initiated during 1972-73 by the Services of Environment Canada and the James Bay Development Corporation that are part of an expanding multidisciplinary program of environmental research that now has as a framework the above-mentioned federal-provincial agreement. Thus this report is not intended in any way to replace the normal reports and maps that will be published containing the full results and details of the study.

CROSS-MISSION PROJECT GROUP

The Project Group was established in March 1972 to examine and make recommendations on Environment Canada's participation in James Bay studies, developing the pattern set by the published report of the Joint Federal-Provincial Task Force. Those who took regular part in the work of the Project Group, including the primary membership, are as follows.*

E.W. Burridge	Fisheries Service (Resource Development Branch)
T. Beaulieu	Fisheries Service (Resource Development Branch)
D.B. Coombs	Lands, Forests and Wildlife Service (Lands Directorate)
D.I. Gillespie	Lands, Forests and Wildlife Service (Canadian Wildlife Service)
I.C.M. Place	Lands, Forests and Wildlife Service (Canadian Forestry Service)
G. Godin	Water Management Service (Marine Sciences Directorate)
W.K. Gummer	Water Management Service (Inland Waters Directorate) (Chairman)
S.K. Krishnaswami	Environmental Protection Service (Ecological Protection Branch)
G.A. McKay	Atmospheric Environment Service (Applications Branch)
R.B. Maclock	Policy, Planning and Research Service (Federal & Provincial Programs Branch)

The Project Group reported back to Environment Canada early in June 1972; it listed (1) ongoing activities, (2) proposed studies that should involve Environment Canada, and (3) proposed studies requiring responsible effort by other federal departments or by provincial agencies. The Group remains in existence to provide a source of continuity and knowledge and furthermore a mechanism for technical inter-Service coordination during the life of the agreement with Quebec.

* Service affiliation shown is that for 1972.

SUMMARY OF FEDERAL-PROVINCIAL AGREEMENT

Negotiations between the Lands, Forests and Wildlife Service and the James Bay Development Corporation were based on the deliberations of the Project Group. Several new projects have since been proposed and others have been completed or modified, but the findings of the Project Group were accepted as the starting point. As was then seen, some projects would fall naturally under the domain of federal agencies while others would require either joint or provincial action. Ultimately a suitable division of project responsibility was reached, and is shown in Appendix B.

Estimates available when the agreement was drawn up indicated that 1972-73 costs would be of the following order:

National	-	\$1,135,000
Mutual	-	925,000
		<hr/>
		\$2,060,000

These figures are still only estimates, but it should be noted that more than half of the national figure represents expenditures for oceanographic studies, for which ship support is required.

In summary, expenditures over the next three years are covered by the following schedule (in millions of dollars):

	<u>National</u>	<u>Mutual*</u>
1973-74	1.5	.5 + .5
1974-75	1.5	.5 + .5
1975-76	1.5	.5 + .5
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for a total of nearly \$10,000,000 including 1972-73 expenditures.

* based on 50:50 cost-sharing of the "mutual" projects, as provided for in the agreement

STATUS AND NATURE OF FEDERAL 1972-73 PROGRAM

A number of projects were initiated during the 1972-73 season, even before the formal execution of the agreement. These projects are summarized in the following sections.

A. Water Management Service - 1972

1. Marine Sciences Directorate

(1) Hydrographic Program

During 1972, hydrographic staff from Central Region, Canada Centre for Inland Waters, using CCGS NARWHAL, undertook surveys on the eastern side of James Bay.

Detailed surveys were carried out over a 10-mile wide corridor, approximately 12 miles offshore. The corridor which commences about 10 miles south of Bare Island was surveyed at a scale of 1:50,000. Its southern limits end at the approaches to Fort George where large scale surveys of 1:10,000 were done.

During the winter of 1971-72, the hydrographic party established extensive horizontal control to facilitate summer operations. Vertical control was also established and tidal stations were in operation during the course of the survey.

In addition, reconnaissance track soundings were carried out on the eastern side of the bay south of Fort George, to Eastmain, and some reconnaissance was also done in Paint Hills and Eastmain. Corridor surveys are expected to continue.

Charts will be published in due course.

Samples of water were obtained at selected points during this work, and when analysis is finished, there will be data available on salinity and some other parameters.

(2) Ice Movement in James Bay

Ice movement relates to current patterns, winds and tides, and a knowledge of ice behaviour as well as its quantity and permanence is necessary for studies of climate, run-off effects, shipping, wildlife sequence, and other aspects.

A box model to predict the movement of ice in James Bay - Hudson Bay - Foxe Basin has been developed. A continuity equation is written for each box and the growth and decay of ice are prescribed empirically. The observed changes in the volumes of the ice in each of the boxes were deduced from the ice charts prepared by the Ice Central Analysis Office of the Atmospheric Environment Service. The resulting matrix is inverted to obtain the ice transports across the boundaries of the boxes during each 14-day interval in each season. Several years of data have been used.

(3) Heat Budget

The heat budget of water in James Bay is under study. Gains and losses of heat as a result of insolation, radiation, evapotranspiration, and other factors are being evaluated. Any imbalance showing up in these calculations relates to water movement in or out of the Bay. A report will be prepared following additional study.

(4) Publications

Earlier in the year the following was issued by Marine Sciences:

Manuscript Report Series No. 24

On the Oceanography of James Bay (F.G. Barber)

The Tides of James Bay (G. Godin)

Circulation in James Bay (T.S. Murty)

2. Inland Waters Directorate

For some years the province has operated a network of sampling stations on the major rivers of the region, for hydrometric and water quality data. Proposals for a significant expansion of this network, including addition of sediment-sampling stations, have been discussed and were put in motion by federal and provincial officials.

B. Atmospheric Environment Service - 1972

Climate and Ice

The objectives of the Atmospheric Environment Service's James Bay Program are (1) to determine the nature of the climatic changes which may result from altered land use, (2) to establish procedures which could be used for the prediction of the climatic impact of land modifications elsewhere, and (3) to provide support for other Cross-Mission programs as well as for the James Bay development program.

A number of Atmospheric Environment Service activities were proposed. They fall into two groups: Impact-oriented Studies and Meteorological Services. Progress within these groups is described below.

1. Impact-oriented Studies

The climatic issues are those relating to altered energy and water regimes that may result from water diversion, storage and regulation. These may be manifest as altered soil and air temperatures, humidities, precipitation, snow cover and ice cover. These features interact with each other and with the regional ecology in a complex manner. The impact studies were conceived principally to evaluate the atmospheric aspects of these changes but also to provide the detail required by users of atmospheric information.

Six studies were proposed:

- (1) Climatic and hydrometeorological change
- (2) Climatic modification and simulation modelling

- (3) Water balance studies
- (4) Surface water temperature regime
- (5) Sea, river and lake ice
- (6) Regional climatology

Priority was given to the inauguration or enhancement of measurement programs which must precede analysis and modelling. Some aspects of these studies are expanded upon below.

(1) Sea, River and Lake Ice

Aerial ice observations for the James Bay Project were started on October 29, 1972. Flights are scheduled to be made about every two weeks during the ice-formation and decay periods, and monthly from January 1 to May 20. Ice cover in the Ungava Bay area is also of interest and is being observed in greater detail than previously as part of the routine observational program for Hudson Straits.

In connection with this program ice thickness measurements were started at Fort Chimo, Deception Bay, Poste de la Baleine, Fort George and Matagami. These complement measurements being taken at six other locations in the general area.

(2) Surface Water Temperature Regime

An airborne radiation thermometer is being used in conjunction with the ice surveys to obtain surface water temperature measurements. These will cease during the winter and be resumed in the spring.

(3) Surface Networks for Climatic and Water Balance Studies

The Quebec Meteorological Service presently operates the basic climatological stations in the province and has already taken steps to develop a network to aid the development program. Exploratory discussions were held with the Quebec Service concerning installation, operation and maintenance of the desired network.

The network requirements for the various Atmospheric Environment Service studies, and for other Environment Canada studies, are being integrated so as to fit into the one single

enlarged network.

2. Meteorological Services

The additional weather services provided include augmented weather programs at airports which are presently playing a major role in transportation to the development area, and also information and studies required for planning and engineering design.

(1) Aviation

Aviation-oriented activities in 1972 were:

- 1) at Matagami - the installation of a surface weather station, and the development of plans for establishment of a weather office in the spring of 1973;
- 2) at Fort George - arrangements for the transfer of the observational program pending the relocation of the airport, and the establishment of radio communication links;
- 3) a survey of the general area to locate new observational sites.

(2) Design

Extensive amounts of climatological information were provided to Hydro-Quebec for the evaluation of the proposed transmission routes from James Bay to Montreal. Advice was also provided to the consulting firm which undertook the study.

Also, in response to requests from Hydro Quebec, a study was made of the freezing precipitation hazard. This study incorporated data for all of eastern Canada since these were needed in developing the mathematical models and to show comparable values. A report, "Estimating the Ice Accretion Hazard", has been prepared. An allied study, "Ice Accretion in Cloud" was carried out. The catastrophic loss of powerlines northeast of Quebec City in 1969 made both studies an urgent necessity.

C. Lands, Forests and Wildlife Service - 1972

1. Migratory Birds, Polar Bears and Caribou

The Canadian Wildlife Service's program in James Bay can be divided into two categories: land use planning and impact studies.

The former follows the system outlined by the Canada Land Inventory. The result, a series of waterfowl capability maps, will be used for planning total resource use.

The impact studies, which cover migratory birds, polar bears and caribou, and their habitats will serve to predict and measure the effects hydro-electric development will have on their populations*. Recommendations arising from those investigations, may be used in future management planning. All reports will eventually be reproduced in the Canadian Wildlife Service James Bay Report series. To date there are six preliminary reports in preparation.

The Canada Land Inventory investigation, a two-year study, was initiated during the summer of 1972. Work included an examination of aerial photographs to select areas of special interest for detailed reconnaissance in the field. Particular attention was given to the basin of La Grande River. The selected areas were flown during the summer of 1972 to measure the waterfowl use of different habitats. The results will be used as indices in the waterfowl capability mapping. In addition to the field work a literature review is being conducted and information abstracted from this material will be used in the final report. A preliminary report, CWS James Bay Report Series No. 4, entitled "La Description des Principaux Eléments Physiographiques de la Région de la Baie James" is in preparation.

Impact studies which to date have placed special emphasis on migratory birds and their habitat were started in 1971 shortly after the Province of Québec's announcement to proceed with the Hydro-electric development.

* Other fauna are being studied by provincial experts under projects of "mutual" interest.

As an initial step the Canadian Wildlife Service began to review all literature pertaining to the area's major waterfowl resources and to compile all harvest data available in its files. That information will be covered in the Canadian Wildlife Service's James Bay Report No. 1 entitled "A Review of the Hudson and James Bays' Goose Information". During the fall of the same year, aerial surveys of the coast of eastern James Bay were made to determine the relative distribution of migratory birds and their utilization of different habitats. Similar investigations of the interior were also made.

In 1972, habitat utilization surveys were repeated on the east coast in an attempt to validate the observations of the previous year. In the fall of the same year, aerial surveys of part of the La Grande River Basin were conducted in order to determine the relative distribution of waterfowl within the various ecosystems of the basin. Those surveys also provided a comparison of waterfowl usage between coastal and interior habitats. That information will be recorded in C.W.S. James Bay Report No. 3 entitled "Aerial Waterfowl Surveys of the Lower La Grande Basin, September, 1972".

Habitat studies were also begun during the summer of 1972. The studies were designed to describe the flora of the coastal zone, to measure the existing environmental factors that influence the vegetation and to develop a model predicting what changes could be expected with habitat changes. The work will be covered in preliminary fashion in C.W.S. James Bay Report No. 2 entitled "Approximation relative à la végétation riparienne de la baie de Rupert, Qué.". There will be an appendix "Contribution à la flore des marécages intertidaux de la baie de Rupert, Qué.". These habitat studies were supported by a preliminary food habitat survey.

The fall activities of 1972 also included polar bear studies. Aerial observations were recorded to identify the pattern of the fall distribution in the coastal area. A more intensive study conducted on the polar bear population of North Twin Island in the James Bay area included tagging and marking for future movement studies.

Plans for a caribou study in co-operation with Quebec were completed early in December, 1972 and the work was carried out during the winter of 1972-73. A literature review has been made to support the study.

In summary, the 1971-72 program conducted by the Canadian Wildlife Service in James Bay was designed to provide baseline information for the design of future programs. The detailed information is contained in a number of reports, that will be made available shortly. Although much of the information was preliminary in nature, it was possible to confirm the earlier views of Canadian Wildlife Service personnel that impacts of the hydro-electric development would be greater in the southern than in the northern La Grande area.

D. Other Services

1. Fisheries Service

Although no active field work has yet been carried out in the James Bay region by the Fisheries Service, areas and subjects requiring study were identified, and discussions were held with provincial agencies in connection with planning the 1973 program.

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The foregoing has outlined the measures that Environment Canada has so far undertaken to improve our knowledge of the environment that is to be affected by the development. Consideration is being given to all aspects of the project which relate to the natural environment and the renewable resources in order that the consequences of development will be foreseen. Base-line studies and monitoring will be carried out in order to identify long term changes.

Recommendations will be made to prevent or minimize the negative impacts of the development. These recommendations will relate to engineering design, management practices and regulations. This research and study program will continue, to permit the developer to incorporate environmental design, or to adopt alternatives, as the work progresses.

STATUS AND NATURE OF THE MUTUAL PROGRAM (1972-1973)

Prior to the execution of the agreement, the James Bay Development Corporation had initiated a number of studies of mutual concern. Many of these originated while the negotiations on the agreement were in progress. The studies are summarized in the following sections.

1. Water Quality

In 1972 the 'Direction Générale des Eaux' of the 'Ministère des Richesses Naturelles' agreed to install and operate a network of stations in the James Bay territory in view of the need to obtain baseline data on water quality.

In June 1972, a first program involving a total of 40 stations (25 on rivers, 15 on lakes) was proposed. The program was then submitted to the potential users of the data and was subsequently readjusted to a total of 32 stations, 23 of which are on rivers and 9 on lakes.

By August 1972, 12 of these stations were already in operation and yielding valuable information on physico-chemical properties and on suspended sediments. By March 1973, 20 stations were in operation. It is expected that the full network will be operational by the early summer of 1973. In 1972, special attention had been given to the La Grande estuary. A series of measurements on suspended sediments, current speed and conductivity were taken during a full tidal cycle. An automatic station to sample suspended sediments was also installed at site LG 1.

2. Water Quantity

For some years the province has operated a network of sampling stations on the major rivers in the region, for hydrometric data. Proposal

for a significant expansion of this network have been discussed and were put in motion by federal and provincial officials. By the end of 1972, the original network had been augmented by 17 river stations and 4 lake stations. It is expected that the full network will have a total of 30 river stations and 6 lake stations.

Part of the program involves measuring the ice thickness and snow cover on approximately 12 lakes in the territory.

3. Vegetation and Soils

Early in the program development process, the necessity for a major study involving a characterization and classification of ecosystems was evidenced. To that end, a multidisciplinary team, comprising an ecologist, a soil scientist and a specialist in vegetation conducted a five-day reconnaissance survey in the La Grande area. The following is a summary of their notes and observations.

The dominant characteristic of the whole area is its position in the subarctic forest which extends across the Quebec-Labrador peninsula, north of the boreal black spruce forest.

The subarctic forest is characterized by a lichen open black spruce forest; a park-like woodland with thick ground cover of light-coloured lichens and ericaceous shrubs among which labrador tea (*Ledum groenlandicum*) is the dominant species. Very rarely is the forest cover closed, except on the middle and lower seepage slopes of climatically-protected deep valleys, as along parts of the George River. The forest rarely reaches merchantable size and where it does, the stands are so old that the potential timber production of the sites does not reach 30 cu. ft./acre/year (i.e., Class 6 of the Canada Land Inventory).

Fire is one of the major controlling environmental factors of the present vegetation occurring in the area; all stages of chronosequences can be seen everywhere, from the recent burn, the ericaceous and lichen barren, the lichen scrub forest to the mature lichen open black spruce forest. It is impossible to predict what the forest would be like if fire were prevented for very long periods; very likely the surface organic horizon would become thicker and ericaceous shrubs would invade the ground vegetation.

Although the general aspect of vegetation seems uniform, discontinuities exist which are related to soils and landforms. Bogs and fens are frequent in the depressions, particularly in the undulating and gently rolling till-covered areas where the slow movement of surface waters favours oligotrophic conditions. In the more strongly rolling and hilly areas, there is more variation in the soil moisture regimes and in the landform patterns, and consequently a greater variation in the vegetation pattern; stands of white birch are seen on the hill slopes, alder swamps occur along streams, and balsam poplar stands are found on the floodplains along river benches.

The southern portion of the territory, in the vicinity of Lake Mistassini, presents the greatest timber potential. Ericaceous closed black spruce forests and moss closed black spruce forests cover large tracts of land, while stands of trembling aspen occur here and there, and stands of white birch are frequent on the lower slopes of the hills.

An approximate evaluation of the area covered by the major landform components is as follows:

bogs and fens-----	10%
poorly-drained mineral soils-----	10%
marine sands and clays-----	5%
well-drained till soils-----	40%
well-drained fluvio-glacial materials-----	10%
shallow-till soils-----	5%
bedrock outcrops and boulder pavements-----	10%
lakes and rivers (as now existing)-----	10%

Approximately 3% of the present terrestrial area will be flooded. The major landforms that will be affected are the poorly-drained mineral soils, bogs and fens, fluvio-glacial materials and floodplains. It is to be expected that flooding will diminish the total length of shoreline area that constitutes ecologically important ground. The fluctuating water levels will destroy all the present vegetation below the high storage levels but it is presently impossible to determine what vegetation will colonize these zones of periodic fluctuation.

4. Forest Inventory

As a first step toward the rational utilization of the forestry resources, a forest inventory of the territory under the jurisdiction of the James Bay Development Corporation was undertaken. Particular attention was given to the areas of forest land that will be flooded. Here it was deemed essential to determine the actual merchantable value of the timber and also the less tangible values.

The forest resources have been divided into five regions of units based on watersheds. From north to south, these are: La Grande, Eastmain, Rupert, Broadback, and Hurricana-Nottaway. The first two have similar characteristics: low timber volumes, the absence of mills and infrastructures, as well as high harvest costs.

In the Rupert, and those units to the south, the situation is different. The forests have an economic potential which justify mill development. Already the forests of the Broadback and Hurricana-Nottaway regions are subject to commercial exploitation.

In brief, the inventory provides timber volumes per acre for areas described as 'productive'. These volumes are stratified by conifer and broadleaf species as well as maturity classes. These data are further divided according to possible areas of inundation. The area of land supporting merchantable timber varies from 2.3% in the La Grande watershed, 14.9% in the Eastmain, 17.5% in the Rupert, 26.9% in the Broadback to 32.8% in the Hurricana-Nottaway watersheds. In a similar way, the volumes per acre increase progressively from north to south.

Finally, a short analysis of the inventory data in terms of possible flooding, marketing potential and economic activities complete the report.

5. Wildlife

(1) Ungulates

Inventory studies of large ungulates were begun in 1972. Aerial surveys in the northern half of the territory and adjacent regions were conducted to determine the relative winter distribution and density of Caribou herds. The surveys have led to a better definition of initial research needs and to the preparation of plans for specific studies on the populations, their movements, and productivity as related to the rate of harvesting and to critical habitat such as calving and summering grounds.

(2) Beaver

Studies on beaver were also undertaken and as a first step, a team of scientists from Laval University evaluated and analyzed raw data from a data bank operated by the Fur Division of the Quebec Wildlife Service. The primary purpose of the exercise was the design of future programs, and in the process an interesting preliminary picture of the situation was assembled.

Wildlife inventories and trapping data for the La Grande River Basin, taking into account their limitations and incompleteness, indicated good stability of the beaver population over the years. Trapping success declined on two gradients, from south to north and from west to east. It also appeared that the animal density in the areas that will be flooded is comparable to that in the areas that will not be affected.

6. Fresh Water Fauna

As part of the program development process, a pilot project involving preliminary limnological and ichthyological studies, was conducted at Lake Sakami in the fall of 1972. The field period was short (16 days) and weather conditions poor, but the main objectives were nevertheless fulfilled as the project provided an early identification of many problems. It indicated for instance that the standard capture equipment is lethal to the whitefish and consequently inadequate for tagging operations. It further stressed the importance of well planned logistics and work schedules that take into account weather constraints. The project also provided some interesting baseline information on Lake Sakami. Eight species of fish were identified, large spawning beds were located and data on water quality and plankton life were collected. The investigators were surprised by the good health of the observed species, these being practically free of serious parasite infestations.

7. Archeology

The development of the archeological sector of the program was initiated in the fall of 1972, following the hiring of an archeologist by the James Bay Development Corporation. The main activities consisted of a ten-day familiarization trip in the territory, the compilation of a bibliography of publications and manuscripts, the evaluation of the work done prior to September 1972 and various tasks which are normally part of the program development process. The area is now known to contain the remains of structures of historical value such as old hunting lodges.

8. Mining

As part of the program of physical inventories, an evaluation of the mining potential of the James Bay territory was undertaken by a firm of consultants.

This inventory comprised a review of all known mineral deposits, a review of mining properties in the areas to be flooded, and a general evaluation of the mining potential of the whole territory on the basis of the general geological information available and more specifically on the basis of an investigation of the structural geology of the area. This evaluation has permitted the identification of seven distinct zones, each one characterized by a set of common features and a distinct potential for mining development. From an environmental viewpoint, this study has contributed to the delineation of areas where impacts from eventual mining development can be expected.

9. Present Utilization of Land Resources

In 1972 two studies relating the present utilization of land to the proposed developments were completed.

(1) Examination of the Social Implications of the Developments

One of these, a report prepared by the McGill University program in the Anthropology of Development, is a sociological study which examines the social life of the inhabitants of the territory, in an attempt to provide an understanding of the possible social implications of the proposals for the James Bay hydro-electric developments.

In the first phase it projects to 1980 the present trends of increasing population, increasing education, and of the rather static mining and forestry industry in the absence of hydro-electric developments. In a second phase it examines the plans of the James Bay Development Corporation, as developed up to May 1972 and suggests how the project would alter life in the area. It considers hunting,

wage work, education, and the role of towns.

Recognizing that this is one of the last areas in the North where native people have successfully followed a way of life which is highly dependent on wildlife resources, the study examines at great length this man-land relationship. It comes to the conclusion that these resources cannot support many more people than they did at the time of the study. The large increase in the number of young adults in the next ten years will result in outmigration if new jobs cannot be created in the North.

(2) Land Use and the Location of Power Transmission Lines

The second study was designed to provide the best possible understanding of the economic, social and ecological aspects of the territory, in view of the need to locate powerlines in such a way as to minimize their negative impacts.

More specifically, the study analyzes the various types of land use in the territory as well as associated aspects such as population density and infrastructure developments. It also includes a general review of the various impacts that powerlines may have on the environment.

The study provides much data and presents it in a mapped form, which will readily permit a delineation of regions or corridors having distinct socio-economic costs.*

* The implication of this statement is that in some regions due to such factors as high population density, high degree of development, or rich resource potential, the installation of power transmission lines can be economically or socially more expensive than in others.

The authors of the study generally conclude that the most important elements to be considered in positioning the powerlines are: 1) large high density population concentrations, 2) lands belonging to indians, 3) forest areas of high capability and productivity, 4) areas of very intensive agriculture or special recreational value, 5) areas of high concentrations of wildlife. Other areas would not be significantly affected by the presence of powerlines.

10. Organization and Coordination of Research Activities

In recognition of the need to integrate all research activities, to set priorities based on required length of studies and construction schedules, and to make certain that all resources are adequately examined, an independent analysis was solicited. A proposal for the organization of environmental studies was submitted.

This proposal identified twelve sub-ecosystems found in the James Bay territory. These were used as a base to examine the studies suggested by both the Corporation and the Government of Canada and to determine other research needs. Major impact areas were identified and a schedule of work with approximate costs recommended. In addition, the opportunities for program coordination and data storage were outlined and suggestions as to organization offered. Timing and priorities were stressed to ensure sufficient 'feedback' time for project modification, should negative effects of activities be identified.

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The foregoing has outlined the activities and mutual interests that have been jointly funded by the James Bay Development Corporation and Environment Canada during 1972. Some of these had been in progress or even completed before the agreement was signed. Environment Canada recognized their validity and pertinence and agreed to share the cost.

Other studies, initiated while the negotiations on the agreement were in progress, are related to the developing program of research.

Many activities in 1972 were short term pilot studies that were part of the program development process. These have yielded relatively little in terms of raw data, but have contributed greatly to the development and implementation of the three year program. This phase is now over; nearly all sectors of research will be fully activated by the summer of 1973.

As with the studies of national interest those of mutual interest have also been designed to provide baseline data permitting the prediction and assessment of the consequences of developments.

From the Corporation's viewpoint however, these studies have to satisfy an additional requirement; that of providing the baseline data necessary to the formulation and implementation of integrated resource management plans. The two objectives are not in conflict, as it is generally agreed that an integrated resource management plan, based on a sound knowledge of the area, is the means of guaranteeing sound environmental management.

APPENDIX A

CHRONOLOGY OF EVENTS LEADING TO THE FEDERAL-PROVINCIAL AGREEMENT

April 1971	-	Announcement by government of Quebec that James Bay development project will proceed.
July 1971	-	Bill 50 enacted giving James Bay Development Corporation powers over municipality, environment, etc. Federal-Provincial Task Force set up and held first meeting before end of the month.
December 1971	-	Task Force report completed.
February 1972	-	Task Force report released. Canada Land Inventory met with Quebec Government to lay first plans for biophysical studies. Program development continued.
July 1972	-	Formal negotiations between Environment Canada and the James Bay Development Corporation began.
November 1972	-	Agreement signed to cover funding of biophysical inventory and environmental impact studies.

A P P E N D I X B

LIST OF STUDY PROJECTS, THEIR CATEGORIZATION AS "NATIONAL", "MUTUAL" (AND "PROVINCE") AND THE STATUS OF WORK AS OF JANUARY, 1973

	NATIONAL	MUTUAL	PROVINCE	STATUS AS OF JANUARY 1973
CLIMATE				
1. Ice Accretion on Structures	X			Completed, report available
2. Enhancement Weather Service	X			In process; new airports will extend needs
3. Data Processing, climate		X		Continued service
4. Sea, River and Lake Ice	X	X		Started; may require several years for proper data
5. Water Balance Studies	X	X		Depends on other projects, not yet started;
6. Surface Water Temperature	X	X	X	Started; may require several years data
7. Climate and hydrometric change		X		Expanded network operational in 1973
8. Simulation Modelling	X	X		Not yet started
9. Synoptic Climate Archives	X	X		Project ready to start.
OCEANOGRAPHY				
10. Oceanography of N.E. James Bay	X			Not yet started; anticipated start nest winter
11. Cause & Prediction of Ice Drift	X			25% completed; to be finished in 1973
12. Hydrographic Survey Corridor to Fort George	X			Continuing; field sheets available for 1972 work; Oceanographic and tidal data to come
13. Analysis & Prediction of Tides	X			Continuing
14. Estuarine Ocean'y, Ruperts Bay	X			Inactive
15. Heat Balance	X			Intermittent effort possible so far.

WILDLIFE

16. Waterfowl Capability maps	X			Entering 2nd and final year
17. Habitat Impact	X			Wildlife aspect to be finished in 1973; Monitoring habitat changes to continue
18. Bird Hazard to Planes	X			Not yet started
19. Polar Bears	X			Continuing
20. Marine Mammals	X			No program proposed yet

FISH

21. Aquatic fauna (freshwater)	X			Preliminary visit; 3-year program to start
22. Primary aquatic activity	X			No program yet
23. Marine ecology	X			Expect to start in 1973
24. Anadromous fish	X			Expect to start in 1973
25. Large speckled trout			X	No program yet

FORESTRY

26. Inventory	X			Capability studies to start in 1973
27. Black spruce (etc) ecology	X			See 26 and 40 - to start in 1973

WATER QUALITY

28. Expand Quebec network	X		X	Underway; data required for several years
29. Support Wildlife, Fish and other programs	X			Program being developed
30. Organic pollution	X			No program yet
31. Potential mine wastes	X			Program being developed

ARCHEOLOGY

32. Archeology & History	X			First reconnaissance in 1972, more planned
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GEOLOGY

33. Sediments (lakes, rivers, bays)	X			To start 1973 (inland): rest under study
34. Permafrost	X			Partly under 30, partly awaiting NRC report on Quebec

	NATIONAL	MUTUAL	PROVINCE	STATUS AS OF JANUARY 1973
35. Earthquakes	X			Continuous records
36. Bedrock & surficial		X		See 39, also some separate studies
<u>RECREATION</u>				
37. Recreation Potential		X		Start 1973 with Biophysical Inventory
38. Aesthetics			X	Start 1973 with Biophysical Inventory
<u>BIOPHYSICAL</u>				
39. Baseline land class'n		X		3-year program to start in 1973
40. Impacts on vegetation		X		To start in 1973; in Biophysical Inventory
41. Land use studies		X		No program yet
42. Airplane and satellite photography		X		Existing photos useful; additional surveys planned for 1973
<u>GENERAL IMPACT</u>				
43. Transmission lines - impact		X		No program yet
44. Wood cutting		X		No program - JBDC considering
45. Transportation effects		X		Program being developed
46. Monitoring impacts		X		Program being developed



